



Completion Report

USING BENEFICIAL MICROORGANISMS TO MITIGATE GHG & BUILD RESILIENT DAIRY FARMING

BOLIVIA

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MR. ELI DOLLERUP NIELSEN

E-mail: eli@biosa.dk

Phone: +45 4777 2270

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1. EXECUTIVE SUMMARY

The project had the overall objective to demonstrate the use of products based on beneficial microorganisms as a mean to achieve sustainable agricultural development in Bolivia. By the promotion of products containing probiotic bacteria (i.e. lactic acid, phototrophic bacteria etc.) and the production of bio-fertilizer, the project assisted Bolivian smallholder farmers, to mitigate GHG emissions and build resilience to climate change. Due to the impacts of climate change, the Bolivian dairy production is based on poor quality forage, which gives rise to increased susceptibility to diseases and a deficient digestive process of the ruminants causing greater emission of methane from the rumen and low productivity. Additionally, current manure management in milk modules is inefficient leading to high emissions of GHGs and lack of sufficient use of manure in the local production of crops.

The expected results of the project were for smallholder dairy farmers to use probiotic supplements in cattle feeding, contributing to a reduced production of methane from enteric fermentation and improved productivity and health of the cattle, generating increased income of the farmers from the sale of milk. That smallholder dairy farmers produce organic fertilizer based on optimized manure management practices, including the application of bio-stimulants, causing reduced GHG emissions from the manure, and allowing farmers to enhance their own production of crops. And, that a new bio fertilizer is produced by Biotop, which is used by agricultural farmers, with the effect of increasing soil fertility and resilience of the agricultural production.

As a result of the implementation of the project, a total of 1190 (411 women and 779 men) beneficiaries received training, of which 337 producers (122 women and 215 men) improved their resilience to climate change, and 417 producers improved their livelihoods. In addition, 337 part-time jobs were created.

On the other hand, due to the use of the probiotic Biotic, the producers improved their production with an average 15%, which allowed an increase in income by a 20% average. Likewise, methane emissions were reduced by 1758 t.

Due to the use of BioBull, 12276 t of organic fertilizer were produced. The producers used in their agricultural plots, improving the organic matter content of the soil by an average 1.556%.

Biotop was able to develop a new biofertilizer based on beneficial microorganisms and humic acids that has been shown to improve potato and vegetable yields by 15%. It is currently in the registration process, before finally being able to commercialise it to the producers. It will be registered as “Nutrifert”, as the previous name was already used by another company.

Biotop and Biosa have an agreement to continue with the agribusiness of the commercialization of Biotic and BioBull in Bolivia.

In general, the project has contributed to the reduction of emissions to have a better environment, it has reduced the poverty of small-scale milk producers, improving their food security and their adaptation and resilience strategies to climate change. Furthermore, the

project has contributed to women having equal opportunities for training and to their economic empowerment, thanks to the increase in their income from the sale of milk. Likewise, the project has contributed to generating and developing an alliance between entities (Biosa, Biotop, producers, associations, and mayors of the municipalities) to achieve sustainable agribusiness. Altogether, it allows to affirm that the project has fulfilled its purpose.

On the other hand, the effects of the rigid quarantine (Covid-19) on the producer's economy, and on the companies in Bolivia has been strong and it is still in the process of recovery. It will depend on state policies so that this recovery can be prompt, however the economic effects are yet to come, since the pandemic is still in force.

This situation is challenging for producers and companies, so the opportunities for continuity and growth of the agribusiness of Biotic, BioBull and Nutrifert should be adjusted to the opportunities that open post-pandemic.

2. ACHIEVEMENT OF RESULTS

2.1 Achievement of outcomes and outputs

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Outcome 1.1:		
<i>Outcome 1.1: Green business concepts tested</i>	3	3 green business concepts have been successfully tested.
<i>Output 1.1.2: Signed partnership agreement</i>	1	1 partnership agreement has successfully been signed.
Output 1.1.1:		
<i>Output 1.1.1. Mother culture produced and delivered from Biosa to BioTop</i>	1200 l	A total of 1200 l Mother culture were successfully produced delivered from Biosa to BioTop.
<i>Output 1.1.1. Product registration/permit to produce by SENASAG</i>	1 pcs	The product registration and permit to produce by SENASAG was successfully archived.
<i>Output 1.1.1 Production facilities at BioTop are ready to produce</i>	1 unit	Semi-automated installations to produce Biotic and Biobull were established.
<i>Output 1.1.1 Trained staff in BioTop</i>	5 persons	5 Biotop staffs received training in the production protocol and implementation of both Animal Biosa and Terra Biosa.
Outcome 2.1:		

<i>Outcome 2.1: Families with increased income from milk production</i>	300	A total of 541 families have increased their income from milk production.
<i>Outcome 2.1: Increase in income for milk producing families</i>	15%	The dairy farmers that used Biotic in their dairy cows increased their income by 13,6% to 21,5%.
<i>Outcome 2.1: Increased milk yields of dairy cattle</i>	10%	A favourable effect of Biotic is evidenced in the increase of milk (yield), which is equivalent to 18.67% in the highlands and 22.58% in the Valley of Bolivia.
<i>Outcome 2.1: Increased organic matter content in agricultural soils</i>	1,5%	The organic matter content of the soils increased by 1,556%.
<i>Outcome 2.1: New jobs created from the production of organic fertilizers by dairy farmers</i>	30	A total of 337 new part-time jobs have been created. Which adjusted to full-time work with 8 hours per day, makes 84 full-time jobs.
<i>Outcome 2.1.: Reduced GHG emission from enteric fermentation & manure management</i>	1525t of CO ₂ e	A total of 1758 t CO ₂ e has been reduced
<i>Output 2.1.1: Dairy cows given Animal Biosa in feeding</i>	3000 units	A total of 3045 cows were given Animal Biosa in feeding.
<i>Output 2.1.1: Trained dairy farmers using Animal Biosa</i>	300 persons	A total of 517 dairy farmers were trained in using Biotic (Animal Biosa)
<i>Output 2.1.2: Farmers marketing organic fertilizer to Biotop (15t/y per farm)</i>	New indicator: 30 farmers using organic fertilizer on their soils.	Farmers decided not to sell. However, 368 farmers did incorporate the organic fertilizer into the soils of forage, potato, and quinoa production.
<i>Output 2.1.2: Organic fertilizer produced by dairy farms</i>	6000 t	A total of 12276 t organic fertilizer has been produced.
<i>Output 2.1.2: Trained dairy farmers producing organic fertilizer with application of Terra Biosa</i>	300 persons	A total of 618 dairy farmers were trained in the use of BioBull (Terra Biosa) producing organic fertilizer.
<i>Output 2.1.3: Bio-fertilizer produced by Biotop</i>	4450 l	Partially accomplished. A total of 2000 liters were produced.
<i>Output 2.1.3: Trained agricultural farmers using bio-fertilizer</i>	30 persons	A total of 31 farmers have been trained in the use of biofertilizers.

<i>Output 2.1.3: Trained dairy farmers using organic fertilizer</i>	300 persons	A total of 538 farmers have been trained in the use of organic fertilizer.
Output 2.1.3		
<i>Output 2.1.3 Organic certification of bio-fertilizer by IMO CERT</i>	1 pcs	The deliverable could not be meet due to the social problems in Bolivia and now the Covid-19.
<i>Output 2.1.3 Product registration of bio-fertilizer by SENASAG</i>	1 pcs	The deliverable could not be meet due to the social problems in Bolivia and now the Covid-19.
<i>Output 2.1.3 Production facilities at BioTop capable of producing bio-fertilizer</i>	1 unit	The production facilities were installed with 3 bioreactors capable of producing the new bio-fertilizer

2.2 Deviations from the planned outputs and activities

The project implemented its activities normally, except for three adjustments that had to be made and which were agreed with the NCF monitoring personnel who were in charge of the project. Here are the details:

Expected outcomes and outputs	Indicators:	Explanation/Achievement of outcomes and outputs:
Output 2.1.2. Dairy farmers produce organic fertilizer based on optimized manure management practices, including the application of Terra Biosa	Planned indicator: Farmers marketing organic fertilizer to Biotop (15 t/y per farm) (30 persons) Agreed indicator: 30 farmers using organic fertilizer on their soils	New indicator accomplished. 538 farmers who produced the organic fertilizer decided to incorporate it into their soils of forage, potato, and quinoa. The farmers decided not to sell the organic fertilizer to Biotop. They preferred using it on their land. Because the benefits in soil quality and crop yield are greater than the sale of the organic fertilizer.
Output 2.1.3. Farmers use organic fertilizer and organically certified bio-fertilizer in their production of crops, with the effect of increasing soil fertility and resilience of agricultural production.	Organic certification of the bio-fertilizer by IMO-CERT	Not accomplished. The rigid quarantine of 2020 in Bolivia did not allow evaluations of the biofertilizer in the registration plots with SENASAG. This forced to repeat the plantings of these plots in November 2020. It is expected to collect the information in the first semester of 2021 and start the registration, it is expected that the registration will be issued in March 2022. Then, the registration with IMO CERT must be done. It is expected that this can be released in July 2022.
	Registration of the new bio-fertilizer by SENASAG	Not accomplished. The rigid quarantine due to Covid-19 (March to August 2020), caused the loss of the demonstration plots of the biofertilizer for SENASAG (registration authority).

		Therefore, a new establishment of the plots had to be made in November 2020 and they will be harvested in April 2021. This inconvenience delayed the start of the registration process. The process is expected to begin in July 2021 and could be issued in March 2022. Biotop will ensure the registration of the Nutrifert Biofertilizer with SENASAG, after the conclusion of the project.
	Bio-fertilizer produced by Biotop (4500 litres)	Partially Accomplished. Until the conclusion of the project, Biotop has produced 2000 litres of biofertilizer. It has not been produced on a larger scale due to the lack of the SENASAG registration that prevents formal sales of the product.

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)		Clarifications/Mean of verification	
Number of beneficiaries reached	women	411	Project reports, pictures, and lists of beneficiaries	
	men	779		
	total	1190		
Number of beneficiaries with increased resilience to climate change	women	122	Project reports, pictures, and lists	
	men	215		
	total	337		
Number of beneficiaries with improved livelihoods	women	148	Project reports, pictures, and lists	
	men	269		
	total	417		
New decent jobs created	full-time	women		Project reports, pictures, and lists
		men		
		total		
	part-time	women	122	
		men	215	
		total	337	
	seasonal	women		
		men		
		total		

3. CLIMATE CHANGE

The project contributed to improving the health of dairy cows, due to the use of Biotic (Animal Biossa), which also generated lower expenses in veterinary services and medicines. Biotic also contributed and improved the dairy cows feed conversion, generating more and even better milk (1,38-3,81 litres of additional milk). With the use of BioBull (Terra Biossa), the producers improved the use of the manure, producing organic fertilizer (12276 t), which they used on their agricultural soils. This way they improved the content of organic material in the soil by 1,556% as well as the biota of the soil, making it even healthier. The use of Nutrifert biofertilizer provides microorganisms in the rhizosphere of the plants (*B. amyloliquefaciens*), acting as a growth promoter and it also strengthens the root system of plants as well as it restores the nutrient cycle and improve the aeration and storage capacity of water from the soils, which helps reducing the use of synthetic inputs and erosion. All together it has contributed to the producers getting a healthier soil that will lead to a healthy agricultural production, making it also more resistant to the climatic variability, improving the economic viability and resilience of the producers.

In terms of mitigation, the project contributed to improve the feed conversion of a total of 3045 dairy cows thanks to the use of Biotic, therefore, it made the enteric fermentation of the cows more efficient, reducing the formation of GHG. The total amount of greenhouse gas emissions was reduced with 1758 t CO₂e.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

Reduction of Emissions for a Better Environment. Thanks to the use of Biotic, it was possible to reduce GHG (methane) emissions because of the reduction of enteric fermentation of 3045 cows. Thanks to the use of BioBull, the emissions (methane and nitrous oxide) of 12276 t of manure that were treated by the producers were reduced. This reduction of GHG emissions directly impacts the quality of the environment.

Poverty Reduction. The use of Biotic improved the health of the cows as well as the milk production. It also contributed to saving resources and it helped increase the income of the families from the sale of milk. Furthermore, the use of organic fertilizer (treated manure) improved the condition of the soil and therefore also the crop productivity, generating a better income. Together the producers increased their income by a 20% average.

When the producers add Biotic and BioBull to the crop production chain, a set of opportunities occurs, that is, maintaining self-employment and creating new jobs in the supply chain such as transporters of bio-inputs, distributors, milk processors and also at Biotop.

Increased Food Safety. Small-scale milk producers benefited from the increased milk production thanks to the use of Biotic, which was used for commercialization and for local consumption. The use of BioBull for the treatment of manure and the production of an organic fertilizer, made the crops have a higher yield (15%), increasing the availability for self-consumption and for the generation of surplus crop production. This generation of surpluses

or income from the sale of milk and crops, gives the opportunity to producer families to have resources to buy food that they do not have at home, ensuring that there is a stability of food, which is a fundamental characteristic of the food safety.

Better resilience to climate change. The milk production strategies of small-scale milk producers have been strengthened, because the Biotic helped the animals to have a better feed conversion rate and health, considering the scarcity and low quality of feed that these animals usually consume. Furthermore, the use of BioBull improved the manure use strategy, before the producers left the manure to a natural degradation that lasted for years, with the use of the bio-stimulant, the process was reduced to a couple of months, so that the organic fertilizer produced, can be used immediately in the agricultural fields, in such a way that it improves the soil, the yields and the soil fertility management strategy, therefore, together, it contributed to a better resilience of the families to the effects of climate change.

Alliances and knowledge for sustainability. The working relationship of NCF, Biosa, producers and Biotop has contributed to the construction of a sustainable alliances over time, because the alliance goes beyond the project, having a business nature, it will last after the validity of the financial support. Likewise, it is essential to recognize that like any construction process, all partners learned and generated knowledge about the alliance and the issue of sustainability. This knowledge was generated at the level of each partner entity and each person, and it will contribute to the strategies of organizational and family resilience.

Gender equality. Milk production is an activity that is carried out by women within the families. For this reason, the project ensured the participation of women in the training and use of Biotic and BioBull (equal opportunities). At each training event, the work done by women was highlighted and events were held at times relevant especially to them. On the other hand, the effect of using Biotic and BioBull, made women able to save time and improve their income. Before, they invested time in production and their cows produced acidic milk or got sick with mastitis, the milk was returned and they had to prepare cheese to reduce the loss, but it took them more time. With the use of Biotic, the cows improved their health and likewise the milk production. The time saved was used for other activities that were previously neglected, the best income for improving performance, it also gives women a greater autonomy, empowering them in their activities within their family as well as in their community.

Environment sustainability. Biotic and BioBull are products that are based on the use of beneficial microorganisms; Likewise, the project worked on the production of organic fertilizer and a new biofertilizer was developed that together have contributed to the mitigation of GHG emissions produced in the enteric fermentation of cows and of manure emissions that were left outdoors (methane). The organic fertilizer produced and the new biofertilizer will contribute to the improvement of soil health and the reduction of synthetic fertilizers, which in general will reduce the emission of nitrous oxide and methane, making the production process more sustainable and harmless to the environment.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

The current government in Bolivia has enacted a series of laws, including the law 144 of the Productive and Community Agricultural Revolution, which intends to contribute to agricultural development using technology with small-scale farmers. Likewise, there is the 300th law of Mother Earth and the integral development to live well of the Bolivians; with this law it is intended that Bolivians have access to decent work in a framework of actions that take care of Mother Earth, in such a way that it does not contribute, for example, to erosion, the use of GMOs and climate change. Finally, there is Law 1333 on the care of the environment, through which any initiative or project must contribute to maintain and care for the environment in which we live and, even more, develop actions to mitigate and/or adapt to the effects of climate change. All laws promote the contribution towards food security and sovereignty, the care of Mother Earth and the fight against climate change.

The project has worked with small-scale dairy and agricultural producers. Likewise, it has coordinated with producer associations and municipal authorities. All of them participated due to the relevance of the project with its priorities to improve the strategy of adaptation to climate change, the mitigation of GHG emissions and the improvement of the quality and health of the soil (Mother Earth), which is the main capital of agricultural and livestock producers.

As it can be seen, the project's actions are highly aligned with the mentioned laws and, therefore, it is important and relevant for national and sub-national authorities (municipalities). Therefore, the project has been an effective contribution to advance compliance with the policies of the Bolivian state.

5.2 Effectiveness

The planned results of the project have been achieved and, in several cases, exceeded. Smallholder dairy farmers from Altiplano and valleys in Bolivia (148 women and 269 men) now use probiotic supplements in the cattle feeding. This way they contribute to a reduced production of methane from enteric fermentation and it also help to improve the productivity and health of the cattle (additional 2,6 litres of milk/cow/day, average), which generate an increased income to the farmers from the milk sale by 20%.

Smallholder dairy farmers produced 12276t organic fertilizer based on optimized manure management practices, including the application of BioBull (bio-stimulant), which allowed the farmers to enhance their own production of crops by an additional 15%. It also helps to improve the quality and health of the soil. The increase of the content of organic matter in the soil is 1,556%, which also generate a diversified and improved economy for the farmers.

Finally, the new biofertilizer, Nutrifert, has been developed based on microorganisms and humic acids, which has demonstrated its efficiency by increasing the yields of potato and vegetable crops by 15%, improving the fertility and resilience of agricultural production.

However, due to the rigid quarantine (Covid-19) decreed in 2020 in Bolivia, the biofertilizer registration processes have suffered a delay. It will be completed by Biotop in the 2021-22 agricultural cycle.

The pandemic severely affected Bolivia. During the rigid quarantine of 2020 from March to August, mobilization was prohibited, so the actions of the project were reduced to a minimum. The biosecurity measures implemented led to a reduction in the effect on the Biotop staff and among the producers.

5.3 Efficiency

The execution of the project allowed to achieve all the expected results with a lower use of planned resources, therefore, the project was highly efficient. The mismatch in the use of resources was mainly due to the rigid quarantine developed in Bolivia in 2020, which reduced project activities. However, this externality had to be overcome by the technical team during the execution of milestone 4, efforts were redoubled to comply with what was planned. However, only the registration of the Nutrifert biofertilizer remains pending, which will be achieved in the 2021-22 agricultural season.

5.4 Impact

The project has worked with small-scale producers, with limited opportunities for their development due to poverty, food insecurity, which is exacerbated by variability and climate change. Therefore, the project has contributed to improving the families' livelihoods, such as the income from the sale of more milk and a higher yield of their crops (financial capital) has been improved, the soil of the farmers land have improved in quality and health as a result of using the organic material and microorganisms, it has also contributed to reduce the emission of GHG, generating greater sustainability to the production process (Natural capital) and thanks to the process of strengthening knowledge, families have improved their understanding of the climate change resilient production processes (Human capital). They have, likewise, improved the health of their animals, and we see a reduction in the incidence of mastitis, this by improving their feed conversion rate (Physical capital). Women have empowered through achieving economic autonomy by improving the income and managing their dairy cows. The project has also contributed to the consolidation of producer's self-employment and the creation of new decent jobs inside the dairy production (Social capital). Collectively, the project has demonstrated contributions to poverty reduction, food security, resilience to climate change, and environmental sustainability.

5.5 Sustainability

The project represents the first phase of the implementation of a five-year business plan. The project has demonstrated efficiency and a favourable cost/benefit ratio for the producers. They have strengthened their knowledge and practices in a more sustainable and resilient way and have proven the economic, social, and environmental benefits of Biotic, BioBull and Nutrifert. Therefore, the first stage of the Biosa and Biotop business plan has been completed.

From now on, the commercial alliance of Biosa and Biotop will continue as to the signed partnership agreement. In Bolivia, the market of the valleys and highlands will be consolidated, for this, negotiations will be made with the municipal governments and the processing companies. The producers who have tried Biotic are buying the product, which is a sign of its efficiency and competitiveness.

In addition, the commercialization of bio-inputs will expand to the Bolivian plains. In fact, Biotop has already started Biotic' entry into that market, between March and June, and demonstrations of the economic, environmental and social benefits are being made with potential clients in that region. In this understanding, the business plan is in development and is what ensures the sustainability of this undertaking in the medium and long term.

Finally, Biotop will complete the registration of the Nutrifert biofertilizer, which will lead to the beginning of the commercialization of this new bio-input among agricultural producers in the Altiplano, Valles and Llanos de Bolivia, which shows the interest and motivation of the company to continue with this venture.

5.6 Coherence

In the previous paragraphs the relevance of the project was explained. In this understanding, the execution of the project was carried out in coordination with the municipal governments that are aligned with government policies on food security and sovereignty, care for the environment, adaptation to climate change and mitigation of GHG. This coordination was achieved thanks to the compatibility of the entities' purposes. An important reason for the coherence of the work with the other entities was that the project was the only one that promoted the use of organic technology for the management of animals. There were other initiatives in the agricultural part, but ours was the only one that had the animal component.

The municipal governments have the responsibility of supporting the population, in the dairy areas, the mayors did the training, but they did not provide tangibly technology that improves productivity and the economy. With the bio-inputs of the project, it was possible to demonstrate that there is a technology and that it is efficient.

On the other hand, coordination with dairy producer organizations (associations or modules) was very important. The efficiency and competitiveness of the bio-inputs were highly appreciated by the producer organizations, as it filled a highly requested demand by the sector.

6. INNOVATION

The project is innovative as it assisted small-scale producers in applying the technology of beneficial microorganisms in their production systems, with the objective to promote environmental, social, and economic benefits. This implies increasing animal health, mitigating GHG emission, building soil fertility and reversing soil erosion.

The Biotic probiotic is innovative, not only for its quality of being based on microorganisms, but also for its liquid nature. Many competing synthetic products are powdered, which complicates their administration to animals. Therefore, a liquid probiotic for animals was a success factor of the innovation.

The fertilizer market in Bolivia is full of synthetic options that are not friendly to the environment. However, the promotion of the treatment of manure, that was not used by the producers, with BioBull and the development of the new Nutrifert biofertilizer, are also innovations that have proven their economic, social and environmental validity, in the fields of the farmers. Representing on their own, an alternative to the use of synthetic products.

The project worked to create commercial alliances between the private sector and small-scale producers, building social inclusive and economic viable businesses that generate increased income and stable sources of employment for the local population. These encompassing characteristics make the business concept unique and innovative compared to business as usual activities.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The project's potential to scale is significant. With the project that is ending, only a small part of the universe of dairy producers in Bolivia (Altiplano and Valles) has been reached, so the growth potential is great.

To continue with the business plan, it must be scaled to medium and large producers located in the eastern part of Bolivia. This process is intended to be done with its own resources and in alliance with private companies. However, for the highlands and valleys of Bolivia, and due to the characteristics and benefits (environmental, social and economic) that bio-inputs have (Biotic, BioBull and Nutrifert), it will be applied to other local initiatives, whose purpose is to contribute to adaptation resilience of production systems.

A sample of the potential for scaling up is the work carried out by BioTop with the Japanese Cooperation (JICA), which disseminated the probiotic BioTic among dairy producers from the central and southern Highlands of Bolivia, who received training in the efficient use of BioTic. Likewise, BioTic is being tested by organizations that receive resources from Switzerland (Patiño Foundation), the results are expected to allow producers in the eastern part of Bolivia to also use the probiotic and achieve the benefits of increasing milk, health and weight of animals. Finally, BioTop applied to new investments in Bolivia, with initiatives that support small milk producers, which could be effective in the first semester of 2021.

8. RISKS

The following risks were considered at the beginning of the project: Quality of the raw materials used in production is insufficient; The fermentation process of products does not proceed optimally; The farm infrastructure disable daily supplement of Animal Bios;

Farmers do not have the appropriate knowledge to subculture products; Disagreement between production size of organic fertilizer and demand; Difficulties in reaching out to the dairy farmers; Missing reporting of results from farmers.

The risks materialized were the last two. The difficulty of reaching dairy producers was evidenced by the rigid quarantine that was established due to Covid-19. The movement of people was prohibited, which complicated the arrival to the producers. However, the project team had to redouble its efforts (increased work hours) to meet the project indicators. The second risk materialized was the difficulty of reporting data from the producers. This was repeated in each phase of the project, the reasons were, lack of time, reading and writing difficulties and the lack of interest from the producers in the information part. As a mitigation measure, community agreements were made with the producers, not individuals, but with the entire community or association, but it was not enough. The mitigation measure that worked was that it was coordinated with a greater number of producers, thus ensuring a minimum percentage of data that would allow generating valid conclusions.

Finally, it should be mentioned that the Covid pandemic has greatly influenced the achievement of the only deliverable that could not be fulfilled in the stipulated time of the project. The biofertilizer registration could not be carried out, because the rigid quarantine did not allow the evaluation of the plots in the field to obtain the registration, a fact for which the plots had to be re-sown in the 2020-21 campaign, it is expected that the data are obtained in April 2021 and presented to the authorities in July 2021 and the registration is obtained in March 2022. The risk of externalities such as Covid-19 was not foreseen, however it could be overcome in most cases, but not in which we depended on the agricultural cycle.

9. MONITORING AND EVALUATION

The actions of the project were monitored by the producers and representatives of the municipalities. In the first case, the demonstrations made on the efficient use of bio-inputs were the moment where producers from other communities or associations were present. In Annex 4 of this document, testimonies of producers are presented that in general terms state the increase in milk production due to the use of Biotic, the improvement of the health of the animals and the respective savings in veterinary expenses, recommendation for other producers to use and benefit. These testimonies were repeated in various places in the highlands and valleys of Bolivia.

In the second case, the municipal authorities were important allies in the dissemination of Biotic and BioBull. The monitoring of them was carried out directly with the producers who are using the bio-inputs. The testimonies of the authorities indicated the efficiency in cost/benefit of the use of the probiotic which helps producers to have better income, the reduction of GHG emissions is a contribution of the municipality to mitigation, a task required by the national government and with the use of organic fertilizer, the productivity of crops and soil is improved in a way that is friendly to Mother Earth.

10. LESSONS LEARNT

A fundamental learning is that products based on microorganisms are better or at least as effective as synthetic products. However, they are more efficient due to their contribution to resilience and the environment.

Producers were very sceptical of the efficiency of organic products, since a lot of medicine is used in dairy production. But, in less than two weeks, they observed the effect in their own cows, and they were surprised by the positive effect.

There is no better way to learn, than by checking the effect of innovations, on your own and under your own conditions. Producers do not believe much in the technology; they need to test it to verify and then evaluate the effectiveness.

Producers highly value the quality and health of the agricultural soil. For this reason, they did not want to sell the organic fertilizer that they produced. Producers value Mother Earth.

Small-scale dairy can be improved significantly in Bolivia. For this, there is a need to improve the livestock feeding management practices, use of data as a basis for decision-making and get a more horizontal relationship between producers and milk processing companies.

Producers highly value the production of organic fertilizer based on manure, however, due to the migration of young people and men, children, women, and the elderly remain at home, in charge of productive, reproductive, and communal work. This situation greatly reduces the time and resources for manure treatment and therefore for hiring additional people to do this work. In the valley conditions, it is different, there is greater economic possibility, and the production of organic fertilizer will increase.

The pandemic and the rigid quarantine affected the producers and the work of the technical team. The producers, understandably, were more focused on selling milk directly, since the processing companies that usually bought the milk, reduced the quotas. Therefore, the use of probiotics became a lower priority. The technical team did their best to meet the project requirements.

In case of having the opportunity to plan the project again, the things that we would do differently would be:

- The probiotic Biotic (Animal Bios) has demonstrated its economic, social, and environmental benefits in dairy farmers. However, a greater range of producers of other animals could have been worked with, such as broilers, egg layers, pigs, and guinea pigs. That opening would have achieved a greater opportunity for product positioning.
- It would have been important that the coverage of the project was not only in Challapata and Capinota, reaching other regions, especially Santa Cruz would have contributed to a greater impact of the project.

- Explicitly include the association with universities, so that students could learn about these initiatives and have better training.
- Include professionals from the social area, who allow us to identify with greater quality the benefits of technology in gender equality and help us methodologically organize a better way of reaching people, but with a more structured gender approach

11. OUTREACH

The project implemented demonstrations with producers in the highlands and valleys of Bolivia. Events were implemented in addition to the training of the producers, the results and effects of the use of Biotic or BioBull were also demonstrated. On this occasion, the printed material was distributed to the attendees.

In these events, short videos were also recorded about the testimonies of the people who used the products and expressed their opinion regarding the benefits of bio-inputs. The videos were also used in other events to exemplify and disseminate the bio-inputs.

Another form of diffusion was the participation in fairs that were organized by the mayors in the municipalities. Biotop was invited and a stand was established, where the progress of the project was shown. On those occasions, the printed materials of the project were also disseminated.

Other important actors in the diffusion were the rural stores that sell agricultural and veterinary supplies. The owners of these stores were also trained and given printed material to disseminate among their customers.

In general, the materials were distributed to producers (dairy farmers and potato and vegetable producers) as well as to technicians (municipalities and stores selling agricultural and veterinary supplies). Likewise, the material was distributed to the public who participated in the rural fairs organized by the mayors in the project work areas.

The material produced by the project were: 2 Calendars (2000 units); 4 Technical sheets about Biotic, BioBull, Nutrifert and compost (8000 units); 1 Banner and 1 Roller (20 units), radial spots (2) and 6 short videos (testimonies). Photos of the materials and links to the videos can be found in Annex 3 of this document.

In the future, Biotop will extend the dissemination of the results to other rural areas of Bolivia, where milk is produced and to producers of small animals (pigs, rabbits, and chickens). In the case of cities, work will be done with veterinarians, whose target audience is pet owners (dogs and cats). In all cases, the probiotic can be used increasingly.

In the case of the biostimulant, the greatest diffusion will continue in the areas of organic food production, such is the case of the area of production of quinoa (highlands) and sesame (plains). The Nutrifert biofertilizer, after its registration, could be marketed in potato, vegetable and forage production areas, crops in which it has demonstrated high efficiency.

Due to the qualities of the bio-inputs and their effects on adaptation and resilience, Biotop will apply to local initiatives, which support the establishment of commercial companies that, in addition to the commercial purpose, provide technology that helps producers improve their adaptation strategies to climate change. This support is important, because the economic effects of the pandemic on producers and also on companies have undermined the financial possibilities of making investments and there is a need to obtain fresh resources that will allow them to cope with the situation that is happening in Bolivia.

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

Expenditures, EUR	Financing, EUR					Total
	NCF	Grantee	Local Partner Biotop		Revenues from the project	
Grantee Biosa	198.902,52	55.561,14			0	254.463,66
Local Partner Biotop	204.902,86		55.610,68		0	260.513,54
Total	403.805,38	55.561,14	55.610,68		0	514.977,20

Biotop has also started selling products generating a revenue on 8.359,12 € so far.

13. CONCLUSIONS AND RECOMMENDATIONS

Biotic has shown its benefits in the quantity and quality of milk (more protein, more fat and fewer somatic cells). The probiotic is being used in the Bolivian highlands and valleys. In the first semester of 2021, it will also be tested with dairy producers from eastern Bolivia.

Biobull has shown its benefits in the degradation of manure, achieving compost production in 50% of the time that was done before. This virtue attracted a lot to the producers since they saw the importance of revitalizing the soil with organic fertilizer.

Producers have completed the construction of compost bins and have expressed their interest in continuing to use this infrastructure, since they see that treated manure helps the fertility of their soils.

Dairy producers have shown improvement in their income thanks to the use of Biotic. In addition, the treatment of fresh manure with the BioBull biostimulant has improved the resilience strategy of milk producing families. The increase in family income and the reduction of GHG emissions allow us to affirm that the project has fulfilled its purpose.

The new Nutrifert biofertilizers has been used in test plots, from which data is being collected that will serve to prepare the documentation for registration with the Bolivian authorities. This process was delayed due to the quarantine generated by Covid-19. It is expected that the documentation for the registration can be entered before the SENASAG in mid-2021. It is expected that the registration can be issued in March 2022, this will be possible, if there are no externalities that harm the process. This delay does not allow the product to be marketed to the producers, although they have already tested it on their plots and are waiting for it to be formally marketed.

The effects of the rigid quarantine (Covid-19) on the economy of producers and companies in Bolivia has been strong and it is still in the process of recovery. It will depend on state policies so that this recovery can be prompt, however the economic effects are yet to come, since the pandemic is still in force. Biotop has expressed, that from their perspective, it would have been important for NCF to issue a guideline for the case of projects that have been affected by the pandemic and the appropriate way to cope with them. The effort of the technical team to comply, in many cases exceeded the care that should be taken to avoid Covid-19. Although it was possible to comply with most of the deliverables (only one remained pending), we see that the future situation will be more challenging, precisely to the economic situation of companies and their customers.

Annexes

Annex 1 Project completion fact sheet

Project Name:	USING BENEFICIAL MICROORGANISMS TO MITIGATE GHG & BUILD RESILIENT DAIRY FARMING		
Project no.	NCF-C7 025		
Country:	Bolivia	Financing:	
		EUR	%
Nordic Partner:	BIOSA	55.561,15	11%
Local Partner:	BIOTOP SRL	55.610,68	11%
Other Partner:			
	NCF grant disbursed	403.805,38	78%
	Total	514.977,20	100.00
Classification:	Combination		
Project cycle:	Project start date: 01-08-2018 Original closing date: 31-01-2021 Actual closing date: 31-01-2021		
Short project description:	<p>The project has the overall objective to demonstrate the use of products based on beneficial microorganisms as a mean to achieve sustainable agricultural development in Bolivia. By the promotion of products containing probiotic bacteria (i.e. lactic acid, phototrophic bacteria etc.) and the production of bio-fertilizer, the project will assist Bolivian smallholder farmers, to mitigate GHG emissions, build resilience to climate change and develop economically viable agribusiness.</p> <p>Globally the livestock sector represents a significant source of GHG emissions, contributing 14.5 % of the total anthropogenic emissions. The main sources of the sector emission come from enteric fermentation in ruminants and manure management. Due to impacts of climate change, the Bolivian dairy production is based on poor quality forage, which gives rise to increased susceptibility to diseases and a deficient digestive process of the ruminants causing greater emission of methane from the rumen and low productivity. Additionally, current manure management in milk modules is inefficient leading to high emissions of GHGs and lack of sufficient use of manure in the local production of crops.</p> <p>The expected results of the project:</p> <ol style="list-style-type: none"> 1. Smallholder dairy farmers use probiotic supplements in cattle feeding, contributing to a reduced production of methane from enteric fermentation and improved productivity and health of the cattle, generating increased income of the farmers from milk sale. 2. Smallholder dairy farmers produce organic fertilizer based on optimized manure management practices, including the application of bio-stimulants, causing reduced GHG emissions from the manure, and allowing farmers to enhance their own production of crops, and to enter the market of fertilizers generating a diversified and improved economy of the farmers. 3. Organic fertilizer produced by dairy farmers forms a basis to produce bio-fertilizer, which is used by agricultural farmers, with the effect of increasing soil fertility and resilience of the agricultural production. 		
Project performance:	Expected Outcomes and Outputs	Achieved	End-of-project status
	See Annex 2 for the complete Result Framework		

<p>Climate change outcomes and impacts:</p>	<p>In terms of adaptation to climate change: A) The project contributed to improving the health of dairy cows, due to the use of Biotic (Animal Biosa), which generated lower expenses in veterinary services and medicines. B) Biotic contributed to dairy cows improve their feed conversion, generating more and better milk (1,38-3,81 litres of additional milk). C) With the use of BioBull (Terra Biosa), the producers improved the use of manure, producing organic fertilizer (12276 t), which they used on their agricultural soils, improving the content of organic material in the soil (1,556% additional), the biota of the soil and therefore the health of the soil. D) The use of Nutrifert biofertilizer provides microorganisms in the rhizosphere of plants (B. amyloliquefaciens), acting as a growth promoter and strengthening the root system of plants, restoring the nutrient cycle and improving aeration and storage capacity of water from soils, reducing the use of synthetic inputs and erosion. Together, it has contributed to the producers having a healthier soil that will lead to a healthy agricultural production and more resistant to climatic variability, improving the economic viability and resilience of producers.</p> <p>On the other hand, in terms of mitigation, the project contributed to improve the feed conversion of 3045 dairy cows thanks to the use of Biotic, therefore, it made the enteric fermentation of the cows more efficient, reducing the formation of GHG. Likewise, the GHG emission from dairy farm manure was reduced, with the project work the emissions of more than 12276 t of manure were reduced, which the producers treated with BioBull (Terra Biosa) as a biostimulant to accelerate the degradation of the manure.</p>														
<p>Development outcomes and impacts:</p>	<p>Reduction of Emissions for a Better Environment. Thanks to the use of Biotic, it was possible to reduce GHG (methane) emissions because of the reduction of enteric fermentation of 3045 cows. This reduction of GHG emissions directly impacts the quality of the environment.</p> <p>Poverty Reduction. The use of Biotic improved the health of the cows and the production of milk, therefore it contributed to saving resources and increasing the income of families from the sale of milk. On the other hand, the use of organic fertilizer (treated manure) improved soil conditions and therefore crop productivity, generating a better income. Together the producers increased their income by an average of 20%. The use of Biotic and BioBull by producers, added to the crop production chain, a set of opportunities for maintaining self-employment (producers) and new jobs in the supply chain, such as transporters of bio-inputs, distributors, milk processors and to the same Biotop.</p> <p>Increased Food Safety. Small-scale milk producers benefited from increased milk production thanks to the use of Biotic, which was used for commercialization and for local consumption. The use of BioBull for the treatment of manure and the production of an organic fertilizer, made the crops have a higher yield, increasing the availability for self-consumption and for the generation of surplus crop production. This generation of surpluses or income from the sale of milk and crops, gives the opportunity to producer families to have resources to buy food that they do not have at home, ensuring that there is a stability of food, a fundamental characteristic of the food safety.</p> <p>Better resilience to climate change. The milk production strategies of small-scale milk producers have been strengthened, because the Biotic helped the animals to have a better feed conversion rate and health, considering the scarcity and low quality of feed that these animals consume. On the other hand, the use of BioBull improved the manure use strategy, before the producers left the manure to a natural degradation that lasted for years, with the use of the biostimulant, the process was reduced to a couple of months, so that the organic fertilizer produced, can be used immediately in the agricultural fields, in such a way that it improves the soil, the yields and the soil fertility management strategy, therefore, together, it contributed to a better resilience of the families to the effects of climate change.</p> <p>Alliances and knowledge for sustainability. The working relationship of NCF, BIOSA, producers and BIOTOP has contributed to the construction of sustainable alliances over time, because the alliance goes beyond the project, having a business nature, it will last after the validity of the financial support. Likewise, it is essential to recognize that like any construction process, all partners learned and generated knowledge about the alliance and the issue of sustainability. This knowledge generated at the level of each partner entity and each person, will contribute to the strategies of organizational and family resilience.</p>														
<p>NCF core indicators</p>	<table border="1"> <thead> <tr> <th data-bbox="440 1821 786 1899">NCF core indicator</th> <th colspan="2" data-bbox="794 1821 1214 1899">Results (quantitative)</th> <th data-bbox="1214 1821 1501 1899">Clarifications/Means of verification</th> </tr> </thead> <tbody> <tr> <td data-bbox="440 1899 786 2004" rowspan="3">Number of beneficiaries reached</td> <td data-bbox="794 1899 1023 1933">women</td> <td data-bbox="1023 1899 1214 1933">411</td> <td data-bbox="1214 1899 1501 2004" rowspan="3">Project reports, pictures and lists of beneficiaries</td> </tr> <tr> <td data-bbox="794 1933 1023 1966">men</td> <td data-bbox="1023 1933 1214 1966">779</td> </tr> <tr> <td data-bbox="794 1966 1023 2004">total</td> <td data-bbox="1023 1966 1214 2004">1190</td> </tr> </tbody> </table>	NCF core indicator	Results (quantitative)		Clarifications/Means of verification	Number of beneficiaries reached	women	411	Project reports, pictures and lists of beneficiaries	men	779	total	1190		
NCF core indicator	Results (quantitative)		Clarifications/Means of verification												
Number of beneficiaries reached	women	411	Project reports, pictures and lists of beneficiaries												
	men	779													
	total	1190													

	Number of people with increased resilience to climate change	women	122	Project reports, pictures and Lists	
		men	215		
		total	337		
	Number of people with improved livelihoods	women	148	Project reports, pictures and Lists	
		men	269		
		total	417		
	New decent jobs created	full-time	women		Project reports, pictures and lists
			men		
			total		
		part-time	women	122	
			men	215	
			total	337	
seasonal		women			
		men			
		total			

Annex 2 Results Framework

Outcome 1.1

Indicator	Latest update	Progress
1.1.1 Green business concepts tested	2021-01-31	3 business concepts (100%)

Output 1.1.1

Indicator	Latest update	Progress
1.1.1.1 Mother culture produced and delivered from Biosa to Biotop	2020-07-31	1 200 l (100%)
1.1.1.2 Production facilities at Biotop are ready to produce	2019-01-31	1 units (100%)
1.1.1.3 Product registration/permit to produce by SENASAG	2019-10-01	1 pcs (100%)
1.1.1.4 Trained staff in Biotop	2019-01-31	5 persons (100%)

Activity	Discussion	Due date	Responsible person	Latest update	Status
Monitor the production quality of Animal Biosa and Terra Biosa at Biotop	Discussion		Unassigned	2021-03-19	Ready
Produce and deliver mother culture to produce Animal Biosa and Terra Biosa	Discussion		Unassigned	2021-03-19	Ready
Set up production facilities and commence production of Terra Biosa	Discussion		Unassigned	2021-03-19	Ready
Set up production facilities and commence the production of Animal Biosa	Discussion		Unassigned	2021-03-19	Ready
Train Biotop staff in the production of Animal Biosa and Terra Biosa	Discussion		Unassigned	2021-03-19	Ready

Output 1.1.2

Indicator	Latest update	Progress
1.1.2.1 Signed partnership agreement	2021-01-31	1 partnerships (100%)

Activity	Discussion	Due date	Responsible person	Latest update	Status
Preparing partnership agreement between Biosa and Biotop	Discussion		Unassigned	2021-03-19	Ready

Outcome 2.1

Indicator	Latest update	Progress
2.1.1 Families with increased income from milk production	2021-01-31	541 families (180%)
2.1.2 Increased milk yields of dairy cattle	2021-01-31	15 % (150%)
2.1.3 Increased organic matter content in agricultural soils	2021-01-31	1.556 % (104%)
2.1.4 Increase in income for milk producing families	2021-01-31	15 % (100%)
2.1.5 New jobs created from the production of organic fertilizers by dairy farmers	2021-01-31	337 permanent jobs (1123%)
2.1.6 Reduced GHG emission from enteric fermentation & manure management	2021-01-31	1 758 tonnes of CO ₂ e (115%)

Output 2.1.1

Indicator	Latest update	Progress
2.1.1.1 Dairy cows given Animal Biosa in feeding	2021-01-31	3 045 units (102%)
2.1.1.2 Trained dairy farmers using Animal Biosa	2021-01-31	607 persons (202%)

Activity	Discussion	Due date	Responsible person	Latest update	Status
Establish demonstration farms for the use of Animal Biosa to dairy cattle	Discussion		Unassigned	2021-03-19	Ready
Monitor and evaluate the effect of using Animal Biosa	Discussion		Unassigned	2021-03-22	Ready
Train farmers in the use of Animal Biosa in the feeding of the dairy cattle	Discussion		Unassigned	2021-03-19	Ready

Output 2.1.2

Indicator	Latest update	Progress
2.1.2.1 Farmers produce organic fertilizer based on optimized manure management practices incl. the application of BioBull	2021-01-31	368 persons (1227%)
2.1.2.2 Organic fertilizer produced by dairy farms	2021-01-31	12 326 t (205%)
2.1.2.3 Trained dairy farmers producing organic fertilizer with application of Terra Biosa	2021-01-31	618 persons (206%)

Activity	Discussion	Due date	Responsible person	Latest update	Status
Establish demonstration farms for the production of organic fertilizer	Discussion		Unassigned	2021-03-19	Ready
Monitor and evaluate the effect of new manure management practices with the use of Terra Biosa	Discussion		Unassigned	2021-03-22	Ready
Obtain contractual agreement between the organic fertilizer producers and BIOTOP, defining sale price and the volumes and dates of deliveries and payment.	Discussion		Unassigned	2021-03-19	Ready
Train farmers in the production of organic fertilizer including new practices of collecting, storing and processing manure with the use of Terra Biosa	Discussion		Unassigned	2021-03-19	Ready

Output 2.1.3

Indicator	Latest update	Progress
2.1.3.1 Bio-fertilizer produced by Biotop	2021-01-31	2 000 l (44%)
2.1.3.2 Organic certification of bio-fertilizer by IMO CERT	2021-01-31	0 pcs (0%)
2.1.3.3 Production facilities at Biotop capable of producing bio-fertilizer	2019-10-31	3 units (300%)
2.1.3.4 Product registration of bio-fertilizer by SENASAG	2021-01-31	0 pcs (0%)
2.1.3.5 Trained agricultural farmers using bio-fertilizer	2021-01-31	31 persons (103%)
2.1.3.6 Trained dairy farmers using organic fertilizer	2021-01-31	538 persons (179%)

Activity	Discussion	Due date	Responsible person	Latest update	Status
Establish demonstration farms for the use organic fertilizer and bio-fertilizer	Discussion		Unassigned	2021-03-19	Ready
Monitor and evaluate the effect of using organic fertilizer and bio-fertilizer	Discussion		Unassigned	2021-03-24	Ready
Set up production facilities and commence the production of bio-fertilizer	Discussion		Unassigned	2021-03-19	Ready
Train agricultural farmers in the use of bio-fertilizer	Discussion		Unassigned	2021-03-24	Ready
Train dairy farmers in the use of organic fertilizer	Discussion		Unassigned	2021-03-19	Ready

Annex 3 Pictures



Visit to the Challapata platform (left) and Capinota platform (right)



Information gathering in Capinota dairy farms



Dairy production in Challapata (top left) and Capinota (top right)



Infrastructure built in Challapata to make organic fertilizer



Compost production in new compost bins



Application of Biobull in cow manure to produce organic fertilizer



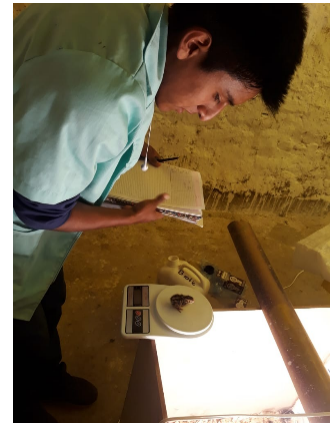
Establishment of biofertilizers' trials in wheat crop.



Training sessions with dairy producers



Milking and milk samples for analysis



Biotic trial with quail, rabbit guinea pig and pigs, in alliance with university in Cochabamba



Nutrifert biofertilizer's trials in different crops



Biotope equipment and facilities for the Biotic, Biobull and Nutrifert production:



Annex 4 Other supplementary deliverables/documentation/links

Videos and links

TESTIMONIAL VIDEOS OF MILK PRODUCERS, USING BIOTIC



CHALLAPATA

<https://www.youtube.com/watch?v=82NjheCJCQw>



CHALLAPATA

<https://www.youtube.com/watch?v=EavyJ2HqVYI>



CAPINOTA

<https://www.youtube.com/watch?v=4hKBkTCIvHk>



CAPINOTA

<https://www.youtube.com/watch?v=uG2xwA98Zq8>



Mallco Rancho, Cochabamba

<https://www.proinpa.org/publico/VideosMP4/Testimonio%20Biotic%20-%20Nelly%20Medrano%20CB~1.mp4>



Mallco Rancho, Cochabamba

<https://www.proinpa.org/publico/VideosMP4/Testimonio%20Biotic%20-%20Shirley%20Mont%3%a1n%20CB~1.mp4>

Radio material:

<https://biotopbolivia.org/publico/Pase-radial-BIOBULL.mp3>
<https://biotopbolivia.org/publico/Pase-radial-BIOTIC.mp3>

Technical sheet" of BIOTIC elaborated based on the experiences in other animals:

www.biotopbolivia.org



BioTic
Probiótico para uso animal

CARACTERÍSTICAS

- **BioTic** tiene una función preventiva porque regula el sistema digestivo de los animales, mejorando su salud, bienestar y productividad. **BioTic** es un probiótico 100% natural y libre de tóxicos.
- Mejora la tasa de conversión alimenticia
- Fortalece el proceso de transformación y absorción de nutrientes
- Controla patógenos intestinales
- Refuerza el sistema inmunológico
- Disminuye la dependencia de los antibióticos
- Aumenta la producción de los animales (leche, carne, huevos, etc.)
- Acelera los tiempos de producción
- Mejora la calidad de los productos
- Reduce los gastos veterinarios

La fermentación que se genera con **BioTic**, brinda frescura y olor sordo al alimento, lo que estimula la digestión y asegura que los nutrientes actúen de manera y sean digeridos fácilmente por los animales, favoreciendo así el funcionamiento estable de la flora intestinal.

En su arsenal, **BioTic** reduce la generación de metano en el sistema digestivo de los animales a niveles óptimos, reduciendo la emisión de este gas de efecto invernadero que contribuye al cambio climático.

COMPOSICIÓN

BioTic es un probiótico natural líquido, resultado de una mezcla de plantas aromáticas y medicinales que han sido fermentadas por una combinación de diferentes bacterias de ácido láctico, con cualidades muy beneficiosas para el organismo del animal.

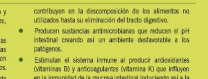







Biotop
Biotecnología para la vida

www.biotopbolivia.org



BioTic
Probiótico para uso animal

MODO DE ACCIÓN

BioTic puede ser usado como suplemento alimenticio y para tratamiento de disbiosis gastrointestinales, inmunológicas y dermatológicas.

- En el intestino delgado del animal las bacterias lácticas compiten por nutrientes con bacterias patógenas, producen sustancias que previenen enfermedades y evitan la penetración de alérgenos.
- Las bacterias lácticas favorecen la absorción de nutrientes, aumentan la microflora benéfica y contribuyen en la descomposición de los alimentos no utilizados hasta su eliminación del tracto digestivo.
- Producen sustancias antimicrobianas que reducen el pH intestinal creando así un ambiente desfavorable a los patógenos.
- Estimulan el sistema inmune al producir antígenos (látexinas E1) y anticogulantes (látexinas K) que influyen en la movilidad de la microflora intestinal induciendo así a la inmunidad sistémica.

INSTRUCCIONES DE USO


BioTic estimula la nutrición y correcta alimentación de vacunos, aves, porcinos, equinos, peces y animales domésticos (perros, gatos, etc.). La aplicación debe considerarse que el animal debe ingerir el 100% de la dosis diaria recomendada.

Reservorio	Categorías	Dosis	Aplicación
Vacunos	Vacas	100 ml/día	Con el agua para beber o con el alimento concentrado durante el ordeño. También puede ser administrado de forma directa a la boca del animal.
	Terrenos	30 ml/día	Con el agua para beber o con inyección bucal
	Cabros/ovinos	10-15 ml/día	Con el agua para beber
	Destetados	10-15 ml/día	Con el agua para beber
Cerdos	Mayores	50 ml/día	Con el agua para beber
	Puercos	25-50 ml/día	Con el agua para beber
	Pinos	50-100 ml/día	
Caballos	Caballos	100-200 ml/día	
	De engorde	1 ml/miaveda	Con el agua para beber o en alimento concentrado
Aves	Ponedoras	0,5 ml/miaveda	
	De engorde	0,5 ml/miaveda	
Coyes	Según tamaño	0,5 - 1 ml/miaveda	En bebedero
Coedores	Según tamaño	0,25 - 0,5 ml/miaveda	En bebedero

PRECAUCIONES Y RECOMENDACIONES

Lea muy bien las instrucciones antes de utilizar el producto

- No ingerir o inhalar, evitar el contacto con los ojos
- Almacenar en su propio envase en lugar fresco y seco, fuera del alcance de los niños.



Biotop
Biotecnología para la vida

Oficina Central de BIOTOP S.L. en Cochabamba
Av. Elias Meneses s/n Km 4 (Zona El Paso)
Tel/Fax: (591-4) 4319522 • Cel: 717808133
Correo Electrónico: p.mamani@biotopbolivia.org

CHALLAPATA - URURU
Av. Ladislao Cabrera s/n entre 9 de Abril y Ecuador
• Cel: 71440294 • 71717344 • (Jose Olivera)
72354125 • (Gusto Encinas)

Banners prepared to support the commercial promotion of BIOTIC:

www.biotopbolivia.org



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BioTic mejora la digestión y fortalece las defensas de los animales. Por tanto, mejora la salud, el bienestar y la productividad. **BioTic** es un probiótico 100% natural y libre de tóxicos que mejora la salud de los animales y conlleva a una mejor productividad.





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"Technical sheets", to support the commercial promotion of BIOTIC for pets

www.biotopbolivia.org



BioTic
Probiótico para uso animal

Especies	DOSIS	Aplicación
Perro raza pequeña	5 - 10 ml/día	Oral, con inyección bucal
Perro raza mediana	10 - 15 ml/día	Oral, con inyección bucal
Perro raza grande	15 - 30 ml/día	Oral, con inyección bucal
Gato	2,5 - 5 ml/día	Oral, con inyección bucal

PRECAUCIONES Y RECOMENDACIONES

Lea muy bien las instrucciones antes de utilizar el producto

- No ingerir o inhalar, evitar el contacto con los ojos
- Almacenar en su propio envase en lugar fresco y seco, fuera del alcance de los niños.

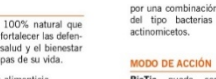


Biotop
Biotecnología para la vida

Oficina Central de BIOTOP S.L. en Cochabamba
Av. Elias Meneses s/n Km 4 (Zona El Paso)
Tel/Fax: (591-4) 4319522 • Cel: 717808133
Correo Electrónico: p.mamani@biotopbolivia.org

CHALLAPATA - URURU
Av. Ladislao Cabrera s/n entre 9 de Abril y Ecuador
• Cel: 71440294 • 71717344 • (Jose Olivera)
72354125 • (Gusto Encinas)

www.biotopbolivia.org



BioTic
Probiótico para uso animal

CARACTERÍSTICAS

BioTic es un probiótico líquido 100% natural que ayuda a mejorar la digestión y a fortalecer las defensas de las mascotas. Mejora la salud y el bienestar de las mascotas en todas las etapas de su vida.

- Mejora la tasa de conversión alimenticia
- Fortalece el proceso de transformación y absorción de proteínas y nutrientes
- Controla los patógenos intestinales
- Disminuye la dependencia de los antibióticos
- Fortalece el sistema inmune
- Reduce los gastos veterinarios

COMPOSICIÓN

BioTic es el resultado de una mezcla de plantas aromáticas y medicinales que han sido fermentadas por una combinación de microorganismos benéficos del tipo bacterias ácido lácticas, levaduras y actinomicetos.


MODO DE ACCIÓN

BioTic puede ser usado como suplemento alimenticio y para tratamiento de disbiosis gastrointestinales, inmunológicas, dermatológicas, entre otros.

- Favorece en la absorción de nutrientes al sistema digestivo y contribuyen en la descomposición de los alimentos no utilizados hasta su eliminación del tracto digestivo.
- Los microorganismos benéficos de **BioTic** compiten con bacterias patógenas y previenen de enfermedades.
- Estimula la inmunidad intestinal al producir antioxidantes y anticogulantes, induciendo así a la inmunidad sistémica.

INSTRUCCIONES DE USO

BioTic estimula la nutrición y correcta alimentación de las mascotas (perros, gatos, etc.). Para el cálculo de la dosis se debe considerar el peso del animal, es decir por cada 5 Kg. de peso vivo del animal se debe dar 1 ml de **BioTic**. El animal debe ingerir diariamente el 100% de la dosis recomendada.



Biotop
Biotecnología para la vida

Rollers made to support the commercial promotion of BIOTIC and BIOBULL:

www.biotopbolivia.org

BioTic mejora la digestión y fortalece las defensas de los animales. Por tanto, mejora la salud, el bienestar y la productividad. **BioTic** es un probiótico 100% natural y libre de tóxicos que mejora la salud de los animales y conlleva a una mejor productividad.

- Mejora la tasa de conversión alimenticia debido a la absorción de proteínas y nutrientes
- Aumenta la producción de los animales (leche, carne, huevos, etc.)
- Fortalece el sistema inmune y reduce el uso de antibióticos
- Inhibe el crecimiento de bacterias que causan enfermedad
- Reduce los gastos veterinarios

Oficina Central de BIOTOP s.a.s. en Cochabamba
 Av. 5 de Mayo s/n R16 - Zona El Pajón
 Tel: +591 (0) 21 85 3025 • Cel.: +591 9855113
 Correo: Bioinsumos@biotopbolivia.org

CHALLAPATA - ORURO
 Av. Simón Bolívar 1972 entre Villamor y Escobedo
 • Cel.: +591 985294 • +591 917354 • Cel: +591 910000
 72256125 • (Guía Biotop)

www.biotopbolivia.org

- Acelerador de descomposición de materia orgánica
- Elimina olores
- Enriquece el ensilaje con microorganismos beneficios y evita timpanismo en el ganado
- Reduce el efecto de hongos y bacterias causantes de enfermedad
- Promueve un mayor desarrollo radicular
- Incrementa rendimientos en más del 10%

Oficina Central de BIOTOP s.a.s. en Cochabamba
 Av. 5 de Mayo s/n R16 - Zona El Pajón
 Tel: +591 (0) 21 85 3025 • Cel.: +591 9855113
 Correo: Bioinsumos@biotopbolivia.org

CHALLAPATA - ORURO
 Av. Simón Bolívar 1972 entre Villamor y Escobedo
 • Cel.: +591 985294 • +591 917354 • Cel: +591 910000
 72256125 • (Guía Biotop)

Technical sheet of Biofertilizer Nutrifert:

www.biotopbolivia.org

NutriFert

Bioestimulante, biofertilizante y promotor de crecimiento

CARACTERÍSTICAS


NUTRIFERT es un concentrado de plantas de origen orgánico y biológico, capaz de incrementar el desarrollo vegetativo, favorecer la absorción de nutrientes y aumentar la productividad en los cultivos.

La combinación de ácidos húmicos, ácidos orgánicos y de alicina a Bacterias anaeróbicas que otorgan a NUTRIFERT las siguientes cualidades:

- Vigorizar y fortalecer los cultivos.
- Estimular su crecimiento y mejorar su color.
- Favorecer la absorción de nutrientes a los cultivos.
- Aumentar la producción y estabilidad de los nutrientes del suelo.
- Promover la capacidad de retención de los nutrientes en las zonas áridas.
- Aumentar la calidad de los frutos y reducir su pérdida.
- Mejorar el contenido de los cultivos.

COMPOSICIÓN

Ácidos húmicos y ácidos orgánicos	77%
Bacterias anaeróbicas	15%
Extracto de salmón	5%
Resonancia	3%



Biotop Biotímicos para la vida

NCF Núcleo Científico de Fertilizantes

MODO DE ACCIÓN

El hecho de usar el biofertilizante NUTRIFERT genera un crecimiento de la biomasa foliar y radicular de las plantas, mejora la calidad de sus frutos y la productividad de los cultivos. Los ácidos húmicos y orgánicos, la hormona vegetal giberelina y la bacteria Bacillus anaeróbicas que otorgan a NUTRIFERT, estimulan el crecimiento de las secundarias y permiten a la planta mayor capacidad de absorción de nutrientes y agua del suelo.

Los ácidos húmicos y orgánicos, al ingresar y pasar por el torrente de sangre, influyen sobre la tasa de fotosíntesis, la síntesis de ácidos nucleicos y la síntesis de proteínas, importante para el desarrollo vegetativo de las plantas.

La bacteria Bacillus anaeróbicas también promueve la absorción de fitonutrientes por exclusión competitiva y sustrato de patógenos. El ácido ascórbico de NUTRIFERT también promueve la recuperación de las plantas después de un estrés ocasionado por sequías, heladas y salinidad. Su uso se recomienda en cualquier etapa de ciclo de vida vegetativo.

INSTRUCCIONES DE USO

CULTIVO	DOSES	APLICACIÓN
Cereales	7-7 Litros	Realizar tres aplicaciones: la primera a la siembra hasta los 10-15 días de salida del suelo.
Frutas	7-7 Litros	Realizar 7 aplicaciones: la primera para riego pre-siembra (10 y 15 días después de siembra) y hasta 8 aplicaciones para el desarrollo (15, 20, 25, 30, 35, 40 y 45 días después de siembra).
Frutales (manzana, durazno, mandarina, nectarina, melocotón, etc.)	2 Litros	Realizar 2 aplicaciones: la primera a la siembra y la segunda entre los 30-35 días de salida del suelo.
Leguminosas, maíz, arroz, etc.	7 Litros	Realizar 2 aplicaciones: la primera a la siembra y la segunda entre los 30-35 días de salida del suelo.
Tubérculos	7-7 Litros	Realizar 2 aplicaciones: la primera a la siembra y la segunda entre los 30-35 días de salida del suelo.

PRECAUCIONES Y RECOMENDACIONES

- No separar el tubo de la solución.
- Usar el producto en el momento de producir el cultivo, solo con agua corriente hasta quitar el exceso de agua.
- Mantener en lugar fresco.
- Respetar las precauciones, leer las instrucciones de uso.

Oficina Central de BIOTOP s.r.l. en Cochabamba
 Av. Elías Méndez s/n Km 4 Zona El Píscar
 • Cel. 71440294 • 71717344 • Cel. 71780813
 • Email: biotop@biotopbolivia.org

CHALLAPATA
 Av. Ladrón Cabrera s/n entre 9 de Abril y Ecuador
 Cel. 71440294 • 71717344

Biotop Biotímicos para la vida

Calendars to support the commercial promotion of BIOTIC:

www.biotopbolivia.org

BioTic 2020

Probiótico para uso animal

100% NATURAL

- Mejora la digestión y fortalece las defensas de los animales.
- Es un probiótico 100% natural y libre de tóxicos que mejora la salud y bienestar de los animales y conlleva a una mayor productividad.



Oficina Central de BIOTOP s.r.l. en Cochabamba
 Av. Elías Méndez s/n Km 4 Zona El Píscar
 Tel./Fax: (591-4) 4319522 • Cel. 71780813
 Correo Electrónico: p.namari@biotopbolivia.org

CHALLAPATA - ORURO
 Av. Ladrón Cabrera 9122 entre Villarroel y Ecuador
 • Cel. 71440294 • 71717344 • Cel. (José Olaya) 72354125 • (García Encinas)

BIOSA **NCF** **Biotop** Biotímicos para la vida

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BioTic

Probiótico para uso animal

100% NATURAL

Es un PROBIÓTICO 100% NATURAL que mejora la digestión y fortalece las defensas de los animales para su salud y bienestar, favoreciendo a una mayor productividad.



Oficina Central de BIOTOP s.r.l. en Cochabamba
 Av. Elías Méndez s/n Km 4 Zona El Píscar
 Tel./Fax: (591-4) 4319522
 • Cel. 71440294 • Cel. 71780813 • Cel. (Rodrigo Narvaiz) 71442233

LA PAZ
 C. Américo Vespucio No. 538, Zon. Pico - Zona Sopocachi
 Tel.: (591) 212141209 • 24152000
 Cel.: (591) 71268707 • (Valderrama Caballero)

CHALLAPATA - ORURO
 Av. Ladrón Cabrera s/n entre 9 de Abril y Ecuador
 • Cel. 71440294 • 71717344 • Cel. (José Olaya)

NCF **Biotop** Biotímicos para la vida

Technical sheet for the production of compost in an infrastructure specially built for this purpose:

que la temperatura no decaiga demasiado rápido, ya que, a mayor temperatura y tiempo, mayor es la velocidad de descomposición y por lo tanto mayor la calidad.

Dependiendo del estado de la biomasa y del contenido de humedad, al inicio y medio del proceso, se puede proceder al riego de la pila, sacando la parte inferior hacia afuera y viceversa. En el proceso del volteo se debe adicionar agua.

Compostera para granjas lecheras familiares

La compostera debe estar ubicada cerca de las corrales de vacas para el fácil acceso del estiércol.

El proceso de elaboración de compost sigue los mismos pasos observados anteriormente. Se recomienda que la elaboración de compost se inicie de abril de la cosecha hacia adelante, de manera de no estar en alta de compost (momento) que se agota totalmente para la pila.

Esta compostera de 3 m de largo y 3 m de ancho permite producir alrededor de 4.5 Tm³ a 2 o 3 meses.

Biossa **NCF** **Biotop**

PRODUCCIÓN DE COMPOST EN PEQUEÑAS GRANJAS LECHERAS

El estiércol fresco en las granjas familiares debe ser almacenado para evitar malos olores, proliferación de moscas, la entrada de roedores (que de ellos inyectan) y un género. La disposición de animales vacas para la producción de leche.

¿Qué es el compost?

El compost es un abono natural obtenido a partir de la acción de microorganismos que actúan y descomponen el material orgánico en un suelo fértil y rico en nutrientes.

¿Qué es el BioBull?

BioBull es un bioestimulante o desinfectante de materia orgánica para el compostaje. BioBull es una mezcla de bacterias probióticas, que actúan fermentando por una combinación natural de microorganismos (bacterias ácido lácticas, hongos micorrízicos y levaduras). BioBull actúa de forma de descomposición, para la elaboración de compost.

¿Cómo se produce el compost?

Los pasos para producir el compost a partir del estiércol vacuno son los siguientes:

1. Cortar un espacio cuadrado en el material de compost, que sea accesible y profundamente cerca de las corrales donde se genera el estiércol para su fácil acceso.
2. Cavar el suelo en plástico de 4m de ancho por 4 m de largo, que servirá de base y sobre el cual se procederá a la elaboración del compost.
3. Para la elaboración del compost, el material orgánico que se utilizará, se lo debe distribuir sobre el plástico, a manera de capas. La primera capa de estiércol se vacía sobre el plástico de manera que tenga una altura de más o menos 22 cm, un ancho de 1 m y un largo de 4 m. Se trata de mantener la altura de la capa, sin apisonarla.

¿Cómo es el proceso de compostaje?

Para que los microorganismos que se aplican con el BioBull puedan descomponer el material orgánico residual y los residuos orgánicos, requieren de:

- buena humedad
- aireación
- una temperatura entre 45°C

Una manera sencilla de controlar la humedad del compost, es aplicar la "técnica del puño", que consiste en cogerse la mano en la pila, sacar un puñado de material y abrirlo mano con mano para que se observe. Si está húmedo, se debe agregar agua; si está muy húmedo se debe agregar agua.

El compostaje de ricas biomasa orgánica y verde debe durar hasta los 65°C en el primer mes y medio, luego se reduce a la temperatura del ambiente, que ocurre hasta los 2.5 meses, que es cuando termina la fase de maduración. Es deseable

Annex 5 Impact story

The project financed by NCF and executed by Biosa and Biotop in Bolivia, sought to improve the income of families and contribute to the sustainability of small-scale milk-producing farms in Bolivia, through the promotion of the use of Biotic (probiotic for animal use) manufactured on the basis of beneficial microorganisms and herbal extracts.

Shirley Montan is a milk producer from the Mallo Rancho community (Sipe Sipe, Cochabamba). She is married to Aldo (a policeman). He leaves for work early in the morning and is away the whole day, so Mrs. Shirley must take care of her three children of the age of 12 and 6 years and 2 months, in addition, she also has to take care of the milk production tasks.

Ms. Shirley has a farm with 6 cows, of which 3 are in production. Before the project, the 3 cows produced 54 litres of milk per day, which generated 20,25 €/day of gross income. On



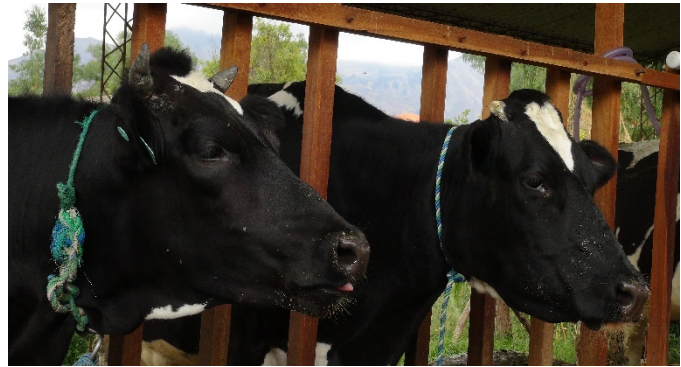


the other hand, she had costs for veterinarians and medicine when the cows suffered from bloating and mastitis, for feeding the cows and for the labour for their management. The costs make a total of 18,19 €/day. Therefore, Ms. Shirley generated a net income of 2,06 €/day, with a return of 10.18%.

Ms. Shirley made the decision to try Biotic to improve the health of her animals and her income. She used the probiotic and after two weeks she

began to see changes in her animals. She

observed that the cows' fur was shiny, that the animal's attitude was calmer, that they had an appetite and finished the food that she gave them, the manure did not have a foul smell, "it is more fermented," she pointed out. These observations of the



animal's health began to affect the milk production too. Now, thanks to Biotic, the three cows produce 69l/day, which is an increase of 5 litres of milk/cow/day, allowing her a gross income of 220.8 Bs/day (€ 25.88/day). After giving the cows Biotic, she experience that the cows does not get sick, so she can actually reduce the costs for veterinarians and medicine, and even with the new cost for Biotic of 4.8Bs/day/3 cows (0.56€/day), she was able to reduce the total costs from 155.21 Bs/day (18.19€/day) to 151.68 Bs/day (17.78€/day). Generating a net income of 69.12 Bs/day (8.1 €/day) and therefore a profitability of 31.3%.

In summary, Ms. Shirley increased her milk production from 54 to 69l/day and achieved an increase in her net income from 17.59Bs/day (2.06 €/day) to 69.12Bs/day (8.1 €/day), which is 3.93 times more than before using Biotic. In addition, her cows are in better health and she now has an additional income that helps her a lot with the needs for her family.